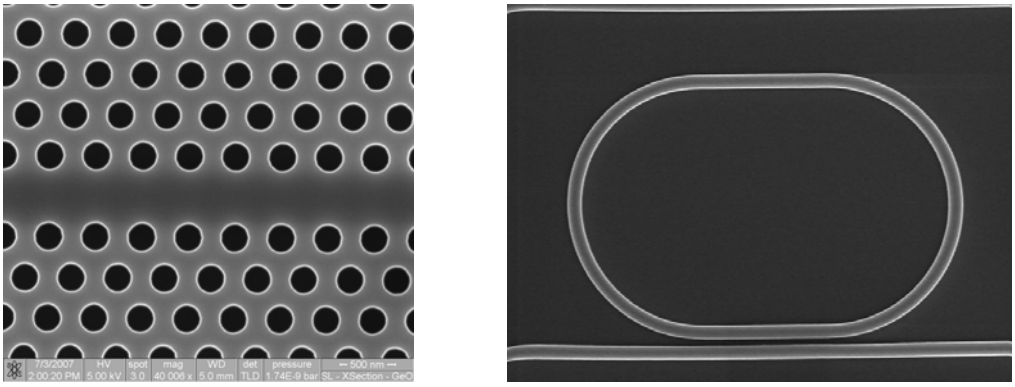
Fabrication of photonic integrated circuits using high resolution CMOS fabrication process

Shankar Kumar Selvaraja
INTEC-IMEC
Gent University, Belgium

Silicon photonics is an attractive platform for wide range of applications. High index contrast and superior material quality enables high-density and low loss photonic integrated circuits. Various optical functionalities such as filtering, modulation are demonstrated on silicon using CMOS compatible fabrication process. CMOS fabrication platform enables mass production thus reducing the cost of the photonic integrated circuits. One of the major advantages of using CMOS fabrication process is the fabrication tools are already in use for fabricating microelectronic circuits. There is no need to develop new tools for fabricating photonic circuits.

Having addressed the advantages of using CMOS fabrication process, one might think, what still holds mass production of photonic integrated circuits. The answer is not simple; one of the major issues is reproducibility of photonic devices. The silicon photonic devices are sensitive to small dimensional changes resulting in change in device response. Roughly 1nm change in the width of a filter will shift the filter peak by 1nm. Hence a high resolution fabrication process is necessary.



(a) (b)

Photonic crystal waveguide (a) and Racetrack ring resonator (b) fabricated using CMOS fabrication process

One of the goals in my research is to address the issue of reproducibility of photonic integrated circuits. The research focuses at high uniformity and reproducibility using advanced CMOS fabrication tools. Studying the source of variation during the fabrication process such as optical lithography and dry etching will result in a scheme to reduce/remove such variations.